SECTION I - BARRIER

DELAWARE
DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS (2004)

SHT. 1 OF 5

09/28/2004

SECTION I - BARRIER (CONT'D)

SECTION II - CURB & GUTTER

SECTION III - DRAINAGE

SECTION III - DRAINAGE (CONT'D)

SECTION IV - EROSION

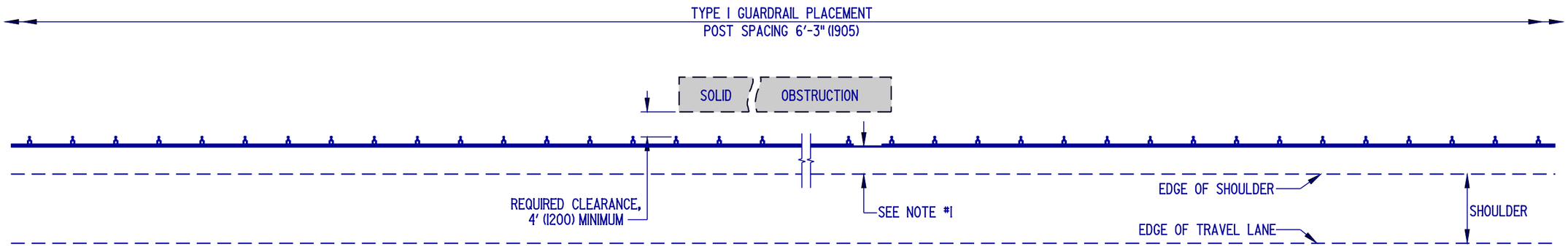
SECTION V - MISCELLANEOUS

SECTION VI - PAVEMENT

SECTION VII - TRAFFIC

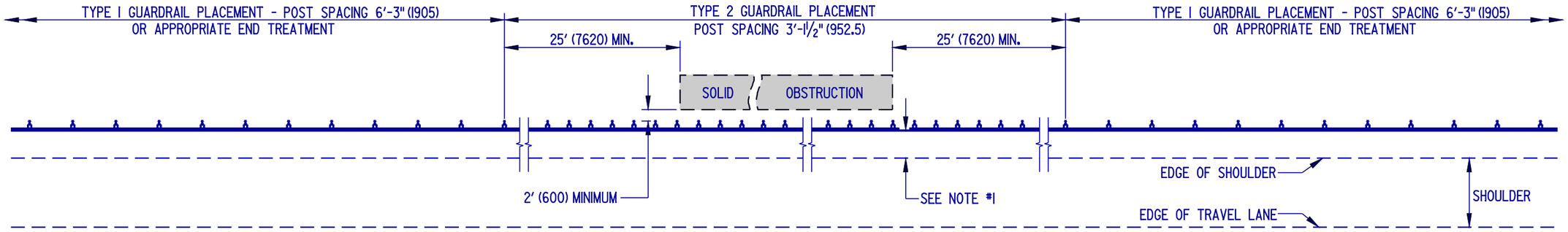
SECTION VII - TRAFFIC (CONT'D)

SCALE : N.T.S.



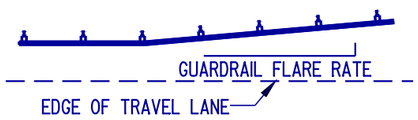
TYPE I GUARDRAIL

TYPICAL GUARDRAIL TREATMENT
WHEN THE REQUIRED 4' (1200) CLEARANCE TO OBSTRUCTION IS AVAILABLE

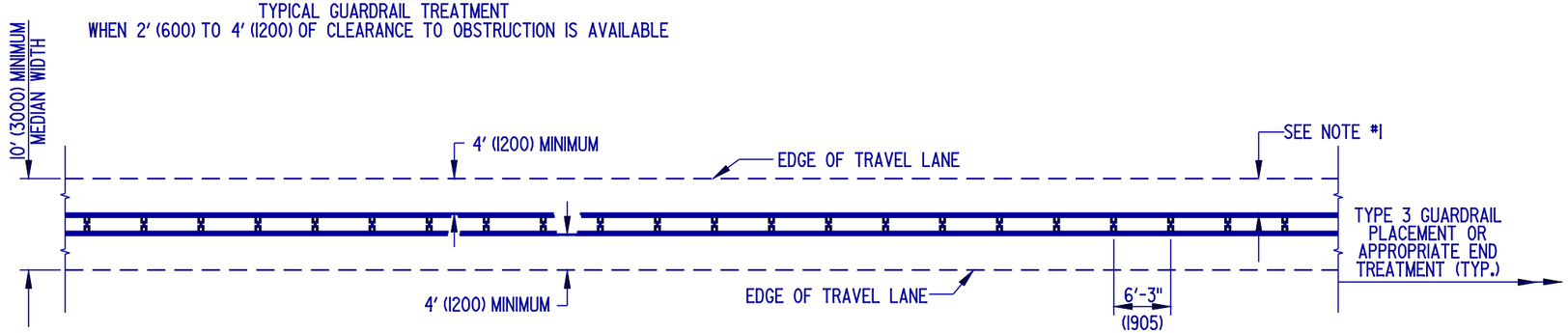


TYPE 2 GUARDRAIL

TYPICAL GUARDRAIL TREATMENT
WHEN 2' (600) TO 4' (1200) OF CLEARANCE TO OBSTRUCTION IS AVAILABLE



FLARE RATES	
DESIGN SPEED	FLARE RATE
70 MPH (110 km/h)	15:1
60 MPH (100 km/h)	14:1
55 MPH (90 km/h)	12:1
50 MPH (80 km/h)	11:1
45 MPH (70 km/h)	10:1
40 MPH (60 km/h)	9:1
30 MPH (50 km/h)	7:1



TYPE 3 GUARDRAIL

TYPICAL GUARDRAIL TREATMENT WHEN A MINIMUM OF
10' (3000) IS AVAILABLE FOR MEDIAN

NOTES : 1). THE DISTANCE FROM THE EDGE OF THE TRAVEL LANE OR SHOULDER TO THE FACE OF GUARDRAIL SHOULD BE MAXIMIZED. THIS AREA SHALL BE GRADED 10:1 OR FLATTER.

2). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

DELAWARE
DEPARTMENT OF TRANSPORTATION

GUARDRAIL APPLICATIONS

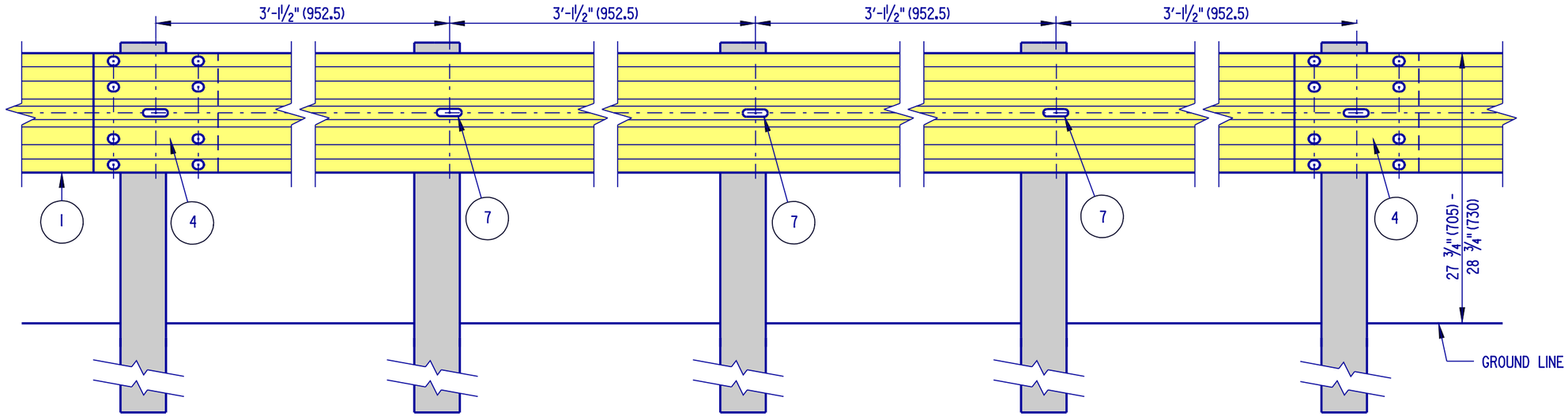
STANDARD NO. B-1 (2004) | SHT. 1 OF 6

APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE

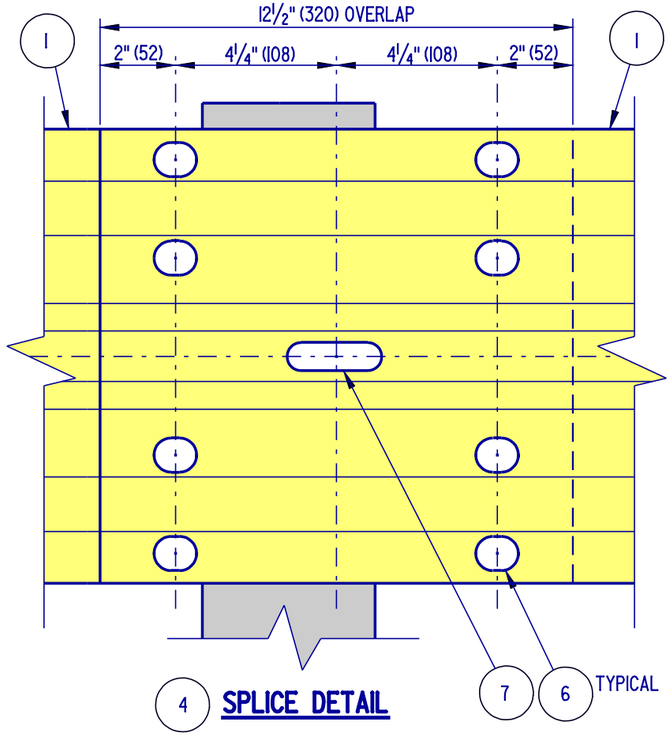
RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

12/08/2004

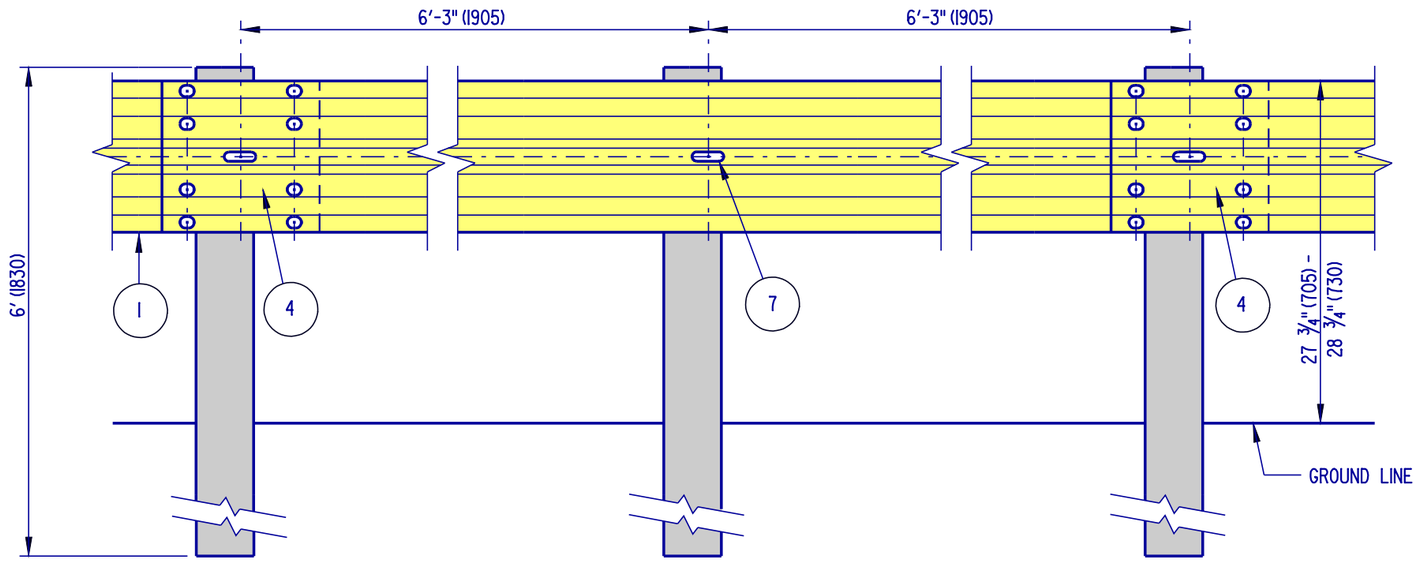
SCALE : N.T.S.



TYPE 2



4 **SPLICE DETAIL**



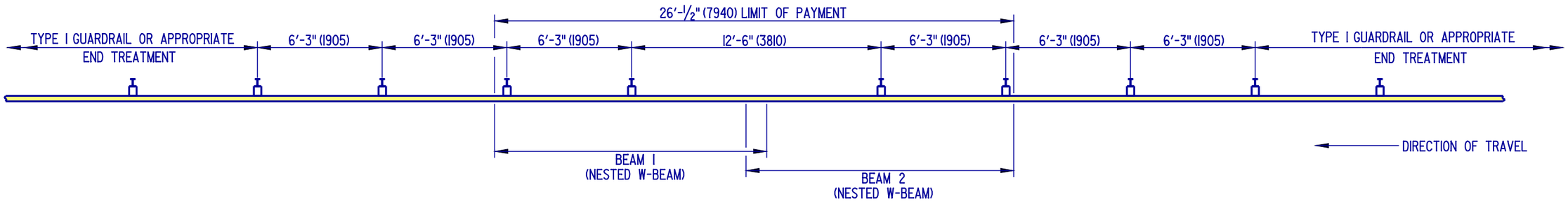
TYPE 1 OR 3

NOTE : OVERLAP W-BEAMS IN DIRECTION OF TRAVEL.

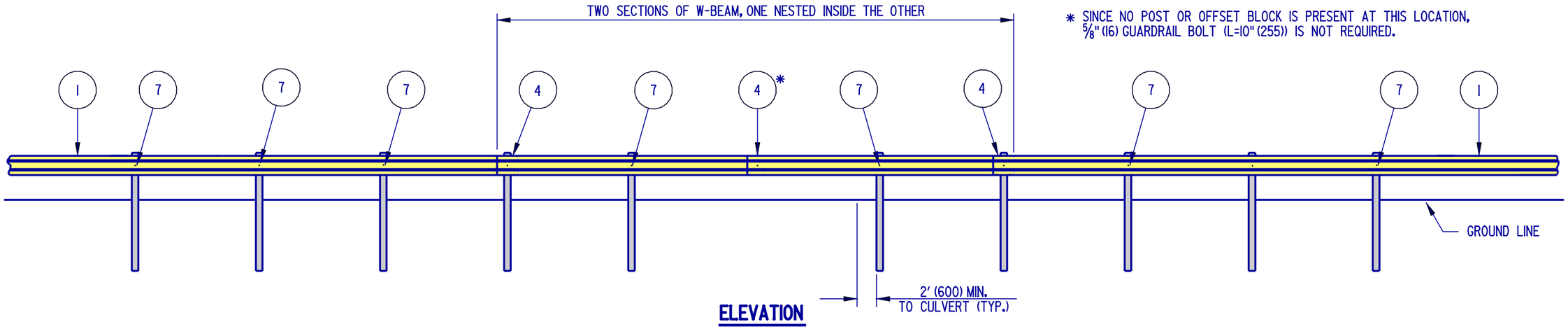
DELAWARE DEPARTMENT OF TRANSPORTATION	GUARDRAIL APPLICATIONS	APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-1 (2004) SHT. 2 OF 6	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

08/24/2004

SCALE : N.T.S.



PLAN



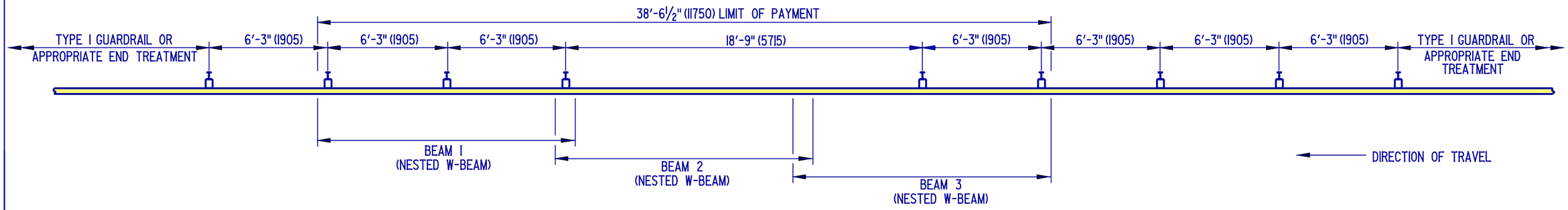
ELEVATION

NOTES :1). ALL W-BEAMS ARE 13'-6 1/2" (4130) IN LENGTH.
2). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

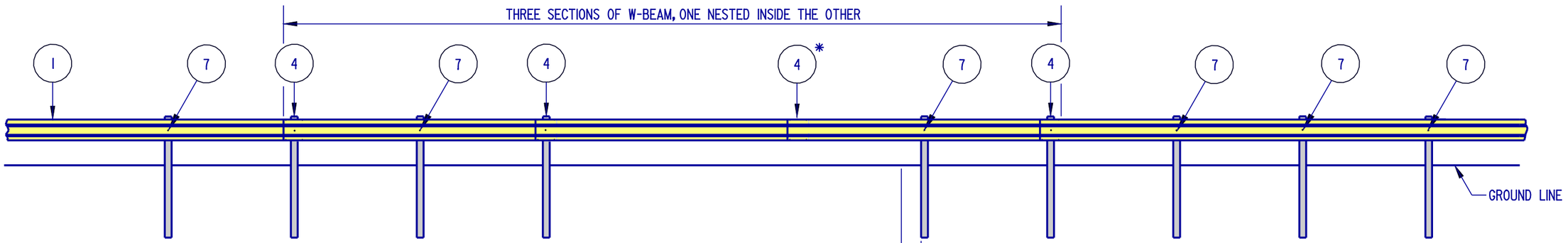
DELAWARE DEPARTMENT OF TRANSPORTATION	GUARDRAIL OVER CULVERTS, TYPE 1	APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-2 (2004) SHT. 1 OF 1	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

12/08/2004

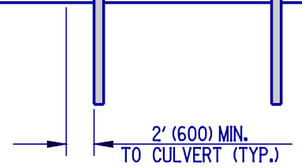
SCALE : N.T.S.



PLAN



ELEVATION



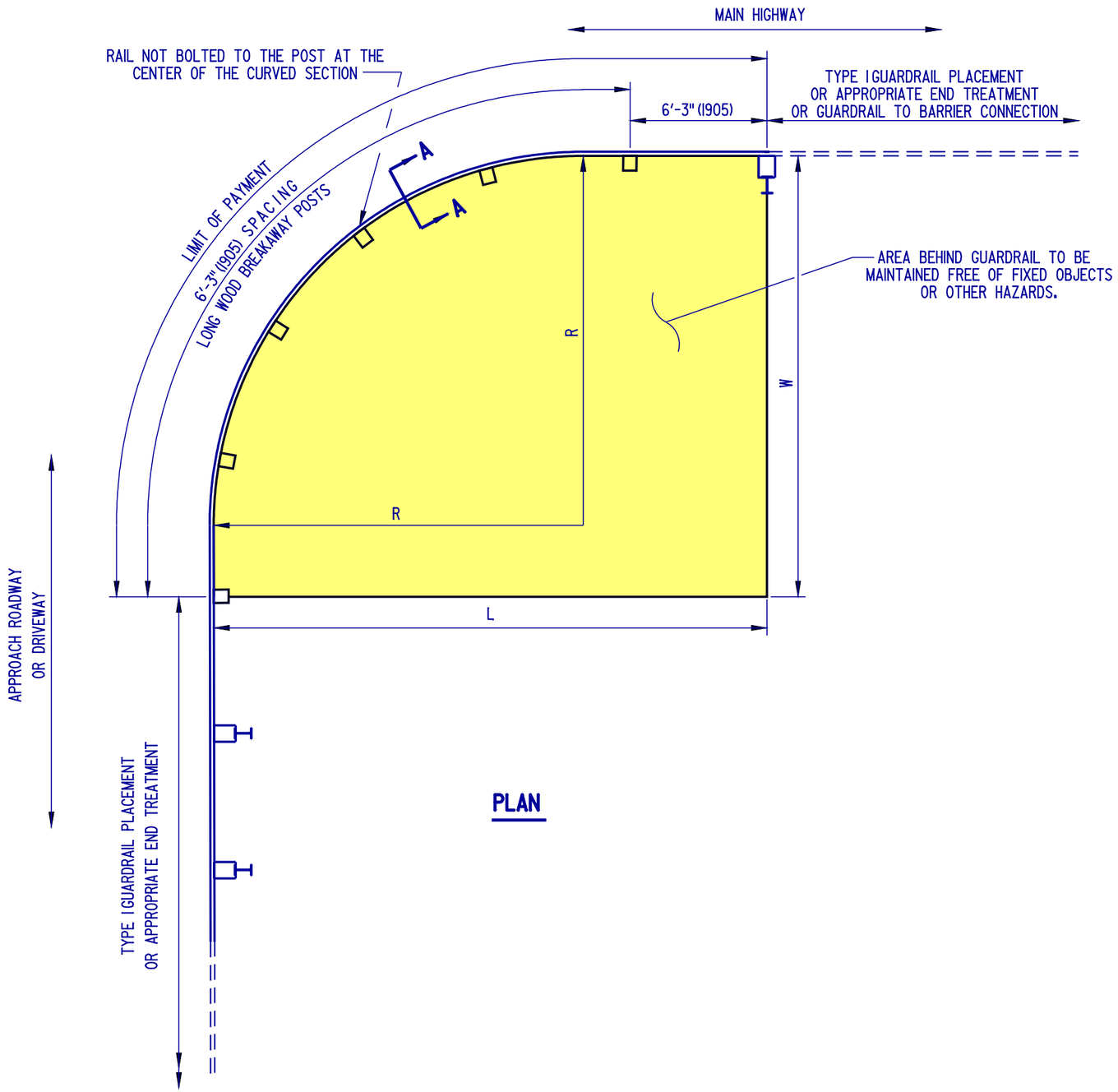
* SINCE NO POST OR OFFSET BLOCK IS PRESENT AT THIS LOCATION, ⅝" (16) GUARDRAIL BOLT (L=10" (255)) IS NOT REQUIRED.

NOTES : 1). ALL W-BEAMS ARE 13'-6½" (4130) IN LENGTH.
2). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

DELAWARE DEPARTMENT OF TRANSPORTATION	GUARDRAIL OVER CULVERTS, TYPE 2	APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-3 (2004) SHT. 1 OF 1	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

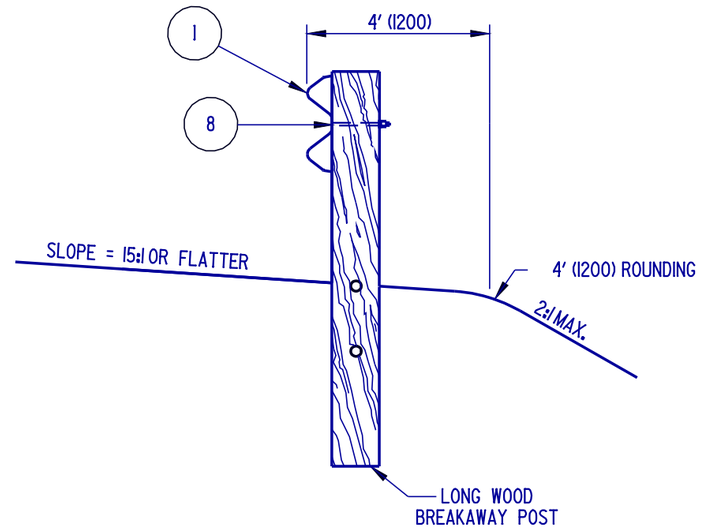
12/08/2004

SCALE : N.T.S.



PLAN

RADIUS	MIN. REQUIRED AREA FREE OF FIXED OBJECTS
	L x W
8'-6" (2600)	25' x 15' (7600 x 4500)
17'-0" (5200)	30' x 15' (9144 x 4500)
25'-6" (7800)	40' x 20' (1200 x 6000)
35'-0" (10700)	50' x 20' (15200 x 6000)



SECTION A-A

NOTES: 1). NO WASHERS ARE USED ON THE RAIL SIDE OF THE LONG WOOD BREAKAWAY POSTS.

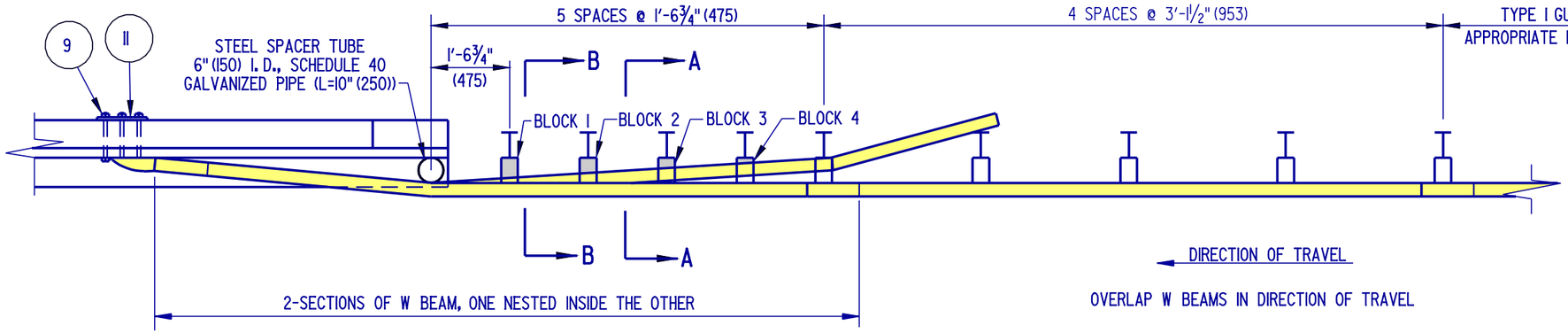
2). THE CURVED GUARDRAIL SECTION SHALL BE SHOP BENT.

3). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

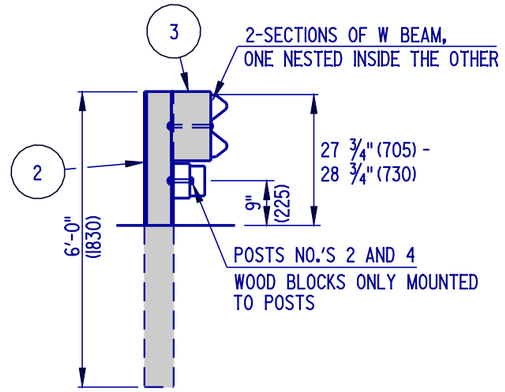
DELAWARE DEPARTMENT OF TRANSPORTATION	CURVED GUARDRAIL SECTION	APPROVED Carolann Wicks (CHIEF ENGINEER) 1/10/05 (DATE)
	STANDARD NO. B-4 (2004) SHT. 1 OF 1	RECOMMENDED Dennis M. Office (DESIGN ENGINEER) 1/3/05 (DATE)

12/08/2004

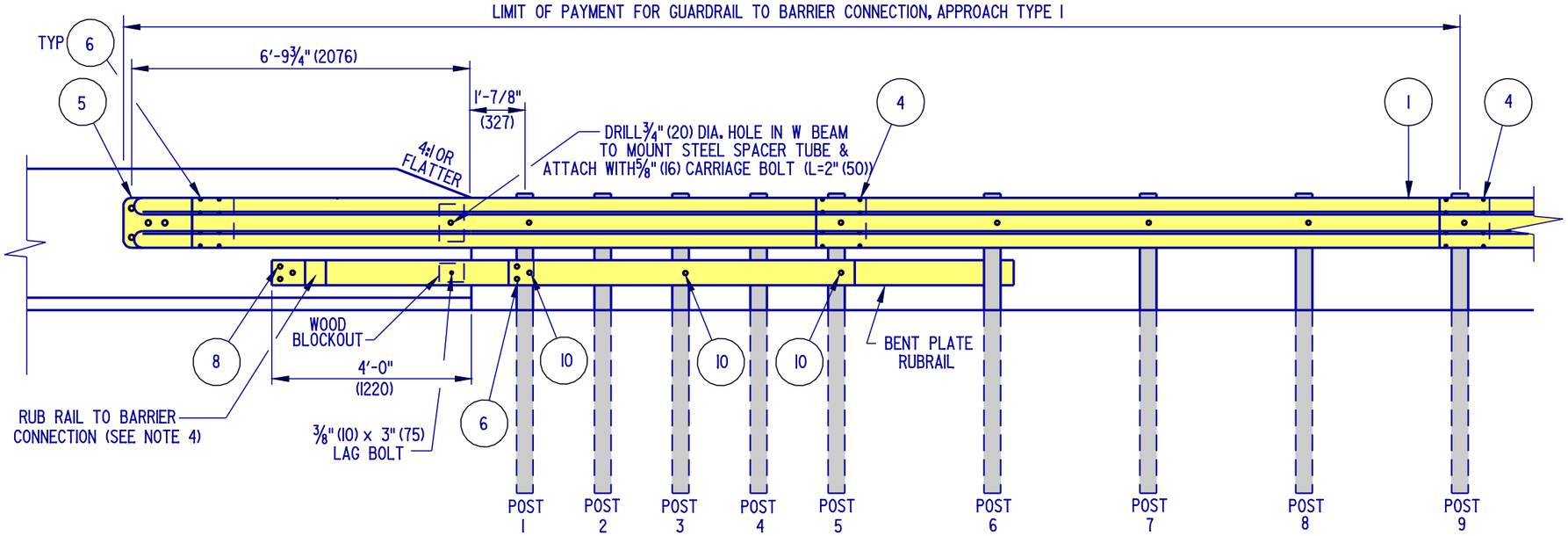
SCALE : N.T.S.



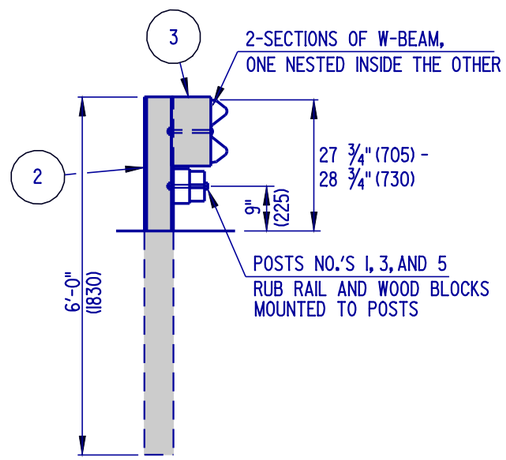
PLAN



SECTION A-A



ELEVATION



SECTION B-B

NOTES:
1). W BEAM IS NOT BOLTED TO POSTS AT POSTS 2 THROUGH 4.
2). RUB RAIL IS NOT BOLTED AT POSTS 2 AND 4.
3). POSTS 1 THROUGH 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER WOOD BLOCKS AND/OR RUBRAIL AND WOOD BLOCK.
4). USE APPROPRIATE EPOXY BOLT ANCHORS TO REDUCE THE CHANCE OF SPLITTING THE CONCRETE. PLACE STEEL WASHERS (FOR ⅝" (16) BOLT) BETWEEN BOLT HEADS AND RUB RAIL.
5). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
6). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.
7). APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.

DELAWARE
DEPARTMENT OF TRANSPORTATION

GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1

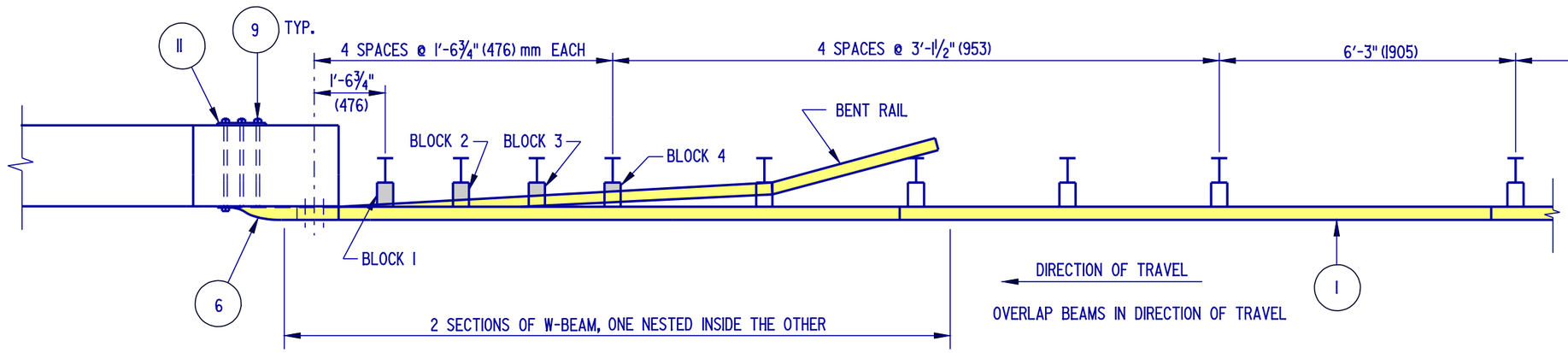
STANDARD NO. B-7 (2004) | **SHT. 1 OF 3**

APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE

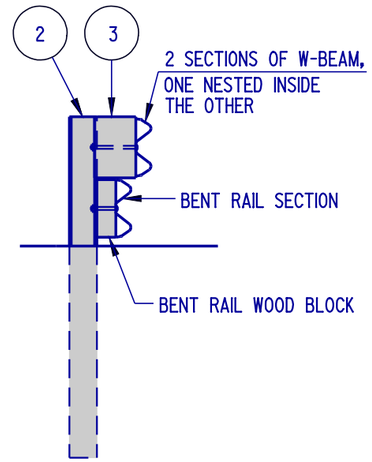
RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

12/08/2004

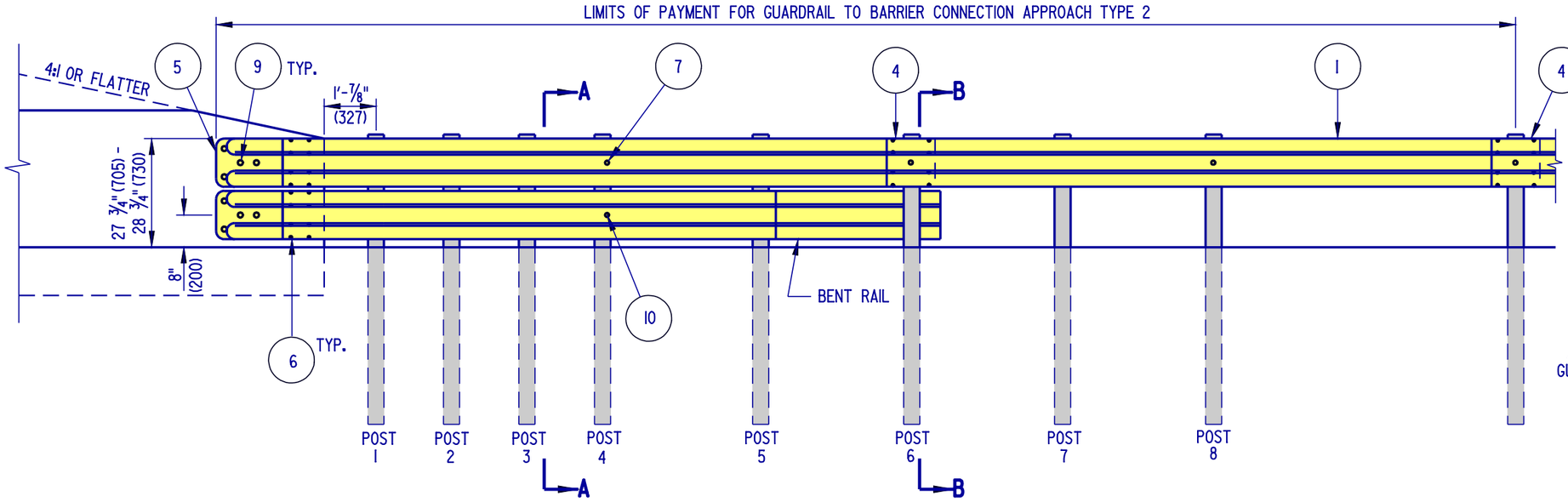
SCALE : N.T.S.



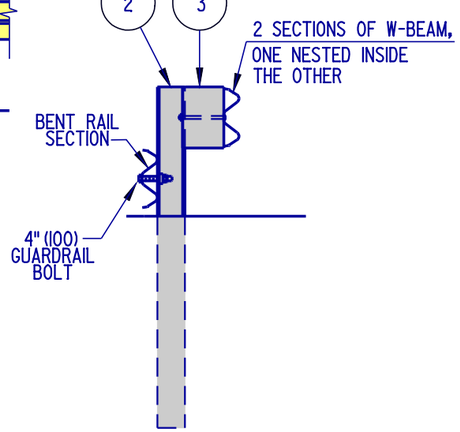
PLAN



SECTION A-A



ELEVATION



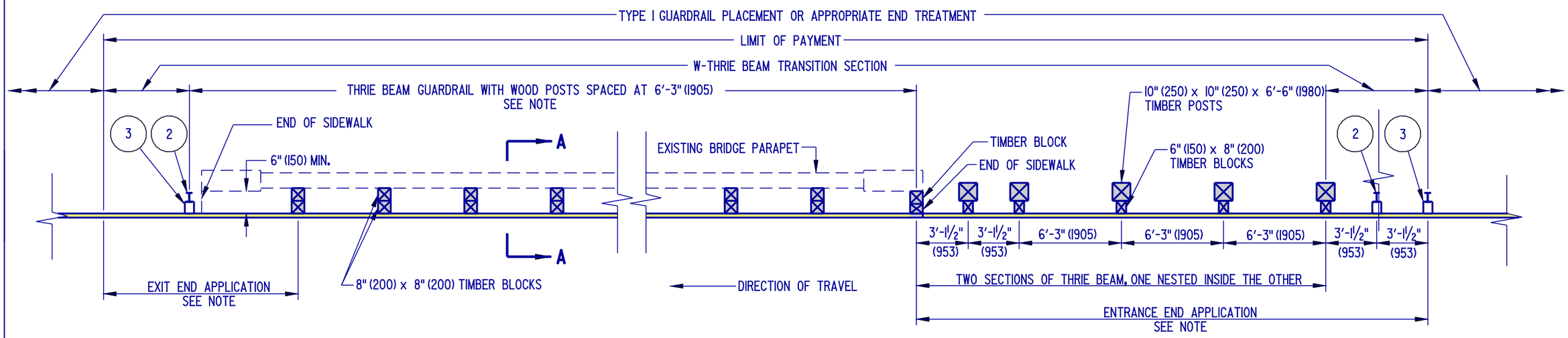
SECTION B-B

NOTES :
1). CURB SHALL NOT BE USED AT THE FACE OF RAIL WITHIN THE LIMITS OF THIS INSTALLATION.
2). POSTS 1, 2, 3, 4, AND 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH WOOD BLOCKS AND/OR BENT RAIL.
3). DO NOT ATTACH RAILS TO POSTS 1, 2, 3, 5, OR 7.
5). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
6). BENT RAIL MAY BE SHOP BENT TO FACILITATE INSTALLATION OR MAY BE FIELD BENT USING HEAT.
7). APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTORS TO PARAPET.
8). PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.
9). WHEN PLACED OVER CURB (MIN 8" (200) HIGH), BOTTOM RAIL CAN BE ELIMINATED.

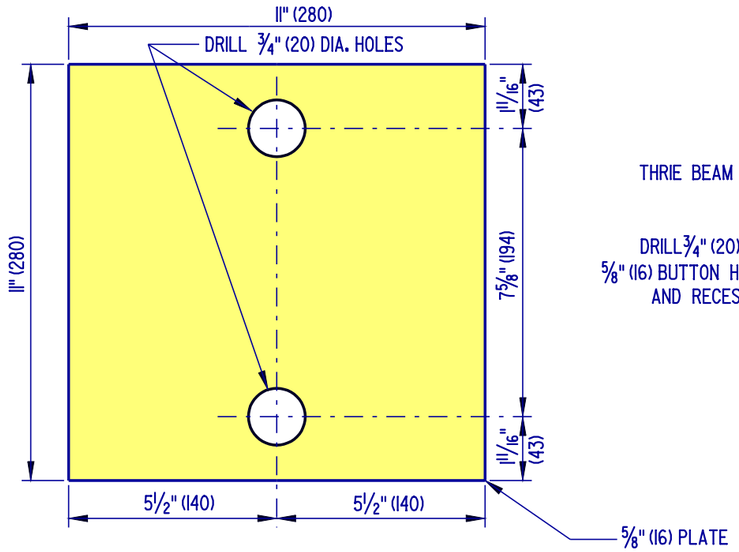
DELAWARE DEPARTMENT OF TRANSPORTATION	GUARDRAIL TO BARRER CONNECTION, APPROACH TYPE 2	APPROVED Carolann Wicks (CHIEF ENGINEER) 1/10/05 (DATE)
	STANDARD NO. B-8 (2004) SHT. 1 OF 2	RECOMMENDED (DESIGN ENGINEER) 1/3/05 (DATE)

12/08/2004

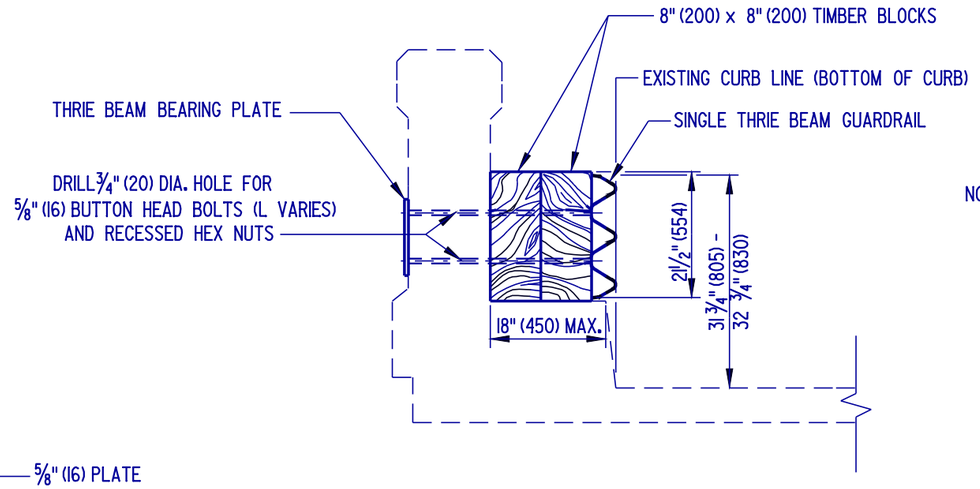
SCALE : N.T.S.



PLAN



THRIE BEAM BEARING PLATE DETAIL



SECTION A-A

NOTES:
1). THIS INSTALLATION SHALL BE USED WHEN THE EXISTING SIDEWALK IS 18" (450) OR LESS.
2). USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.
3). PLACE GUARDRAIL REFLECTOR IN THE UPPER VALLEY OF THE THRIE BEAM EVERY FIFTH POST.
4). TIMBER BLOCK THICKNESS SHALL BE ADJUSTED TO ALLOW FACE OF THE THRIE BEAM TO BE FLUSH WITH BOTTOM OF CURB (MINIMUM THICKNESS SHALL BE 4" (100)).
5). THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER SITUATIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.
6). SPACING OF WOOD POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.

DELAWARE
DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL RETROFIT, TYPE 1

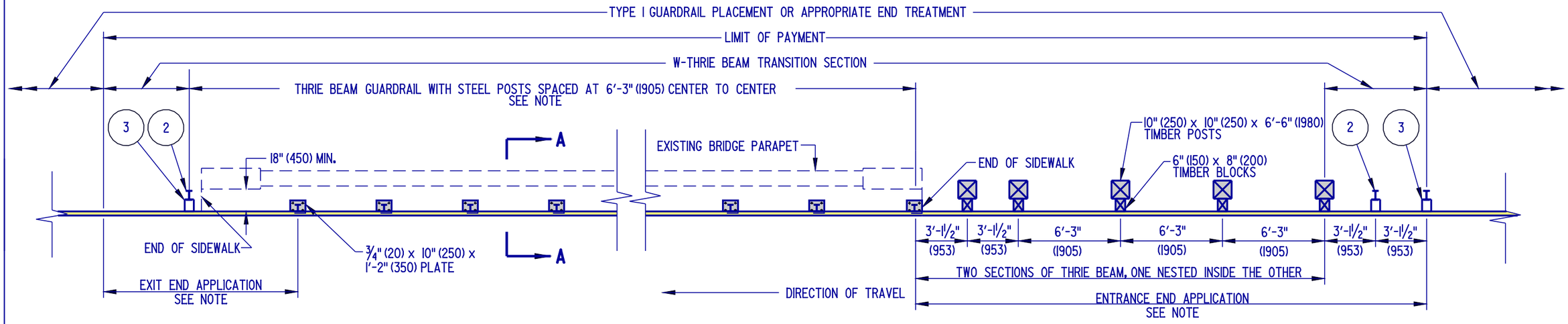
STANDARD NO. B-10 (2004) | SHT. 1 OF 1

APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE

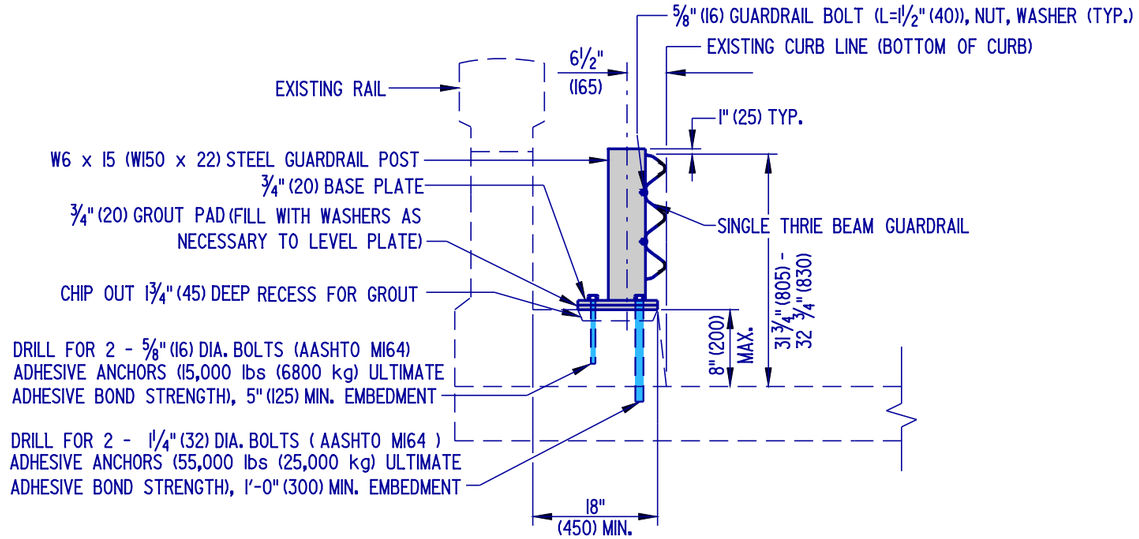
RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

12/08/2004

SCALE : N.T.S.



PLAN



SECTION A-A

NOTES:
1). THIS INSTALLATION SHALL BE USED WHEN THE EXISTING SIDEWALK IS 18" (450) OR WIDER, AND DEAD LOAD CONSIDERATIONS ARE A CONCERN WHEN USING BRIDGE RAIL RETROFIT, TYPE 3.
2). ADHESIVE ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND SHALL BE GALVANIZED.
3). USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.
4). PLACE GUARDRAIL REFLECTOR IN THE UPPER VALLEY OF THE THRIE BEAM EVERY FIFTH POST.
5). THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER SITUATIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.
6). SPACING OF STEEL POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.

DELAWARE
DEPARTMENT OF TRANSPORTATION

BRIDGE RAIL RETROFIT, TYPE 2

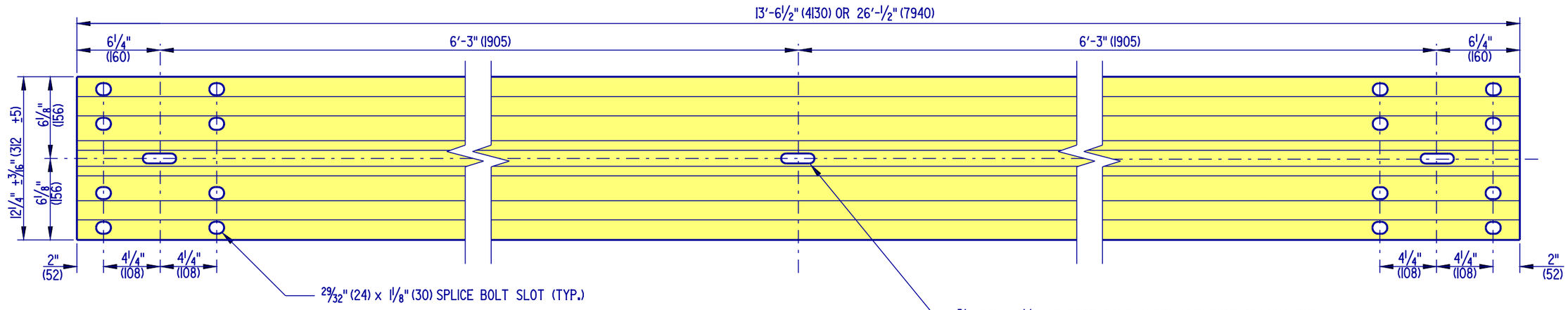
STANDARD NO. B-11 (2004) | SHT. 1 OF 4

APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE

RECOMMENDED Dennis M. Office DESIGN ENGINEER 1/3/05 DATE

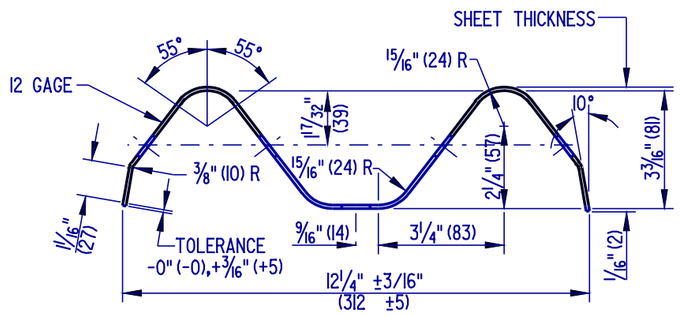
12/08/2004

SCALE : N.T.S.



W-BEAM ELEVATION

1



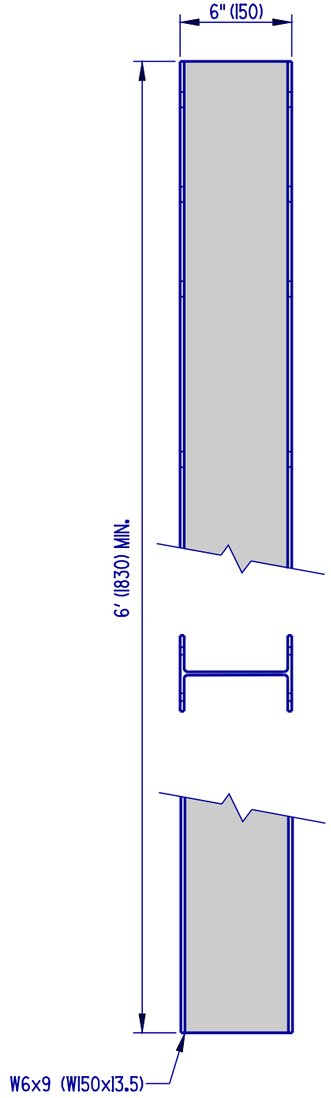
W-BEAM SECTION

NOTES: 1). TWO ADDITIONAL ¾" (20) x 2½" (65) SLOTS SHALL BE PROVIDED AT 6'-3" (1905) SPACING FOR BEAM LENGTH OF 26'-½" (7940).

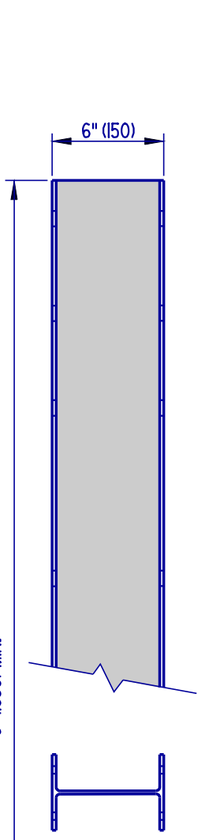
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE	APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004) SHT. 1 OF 13	RECOMMENDED Dennis M. Office DESIGN ENGINEER 1/3/05 DATE

09/21/2004

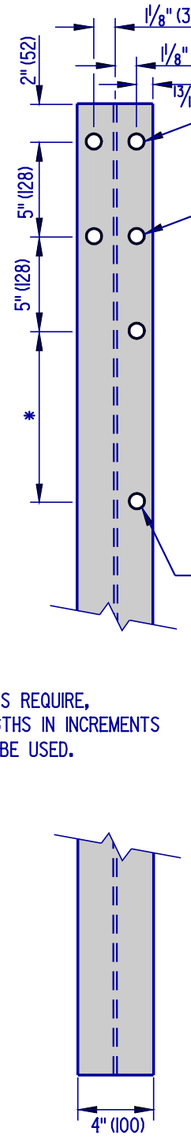
SCALE : N.T.S.



SIDE

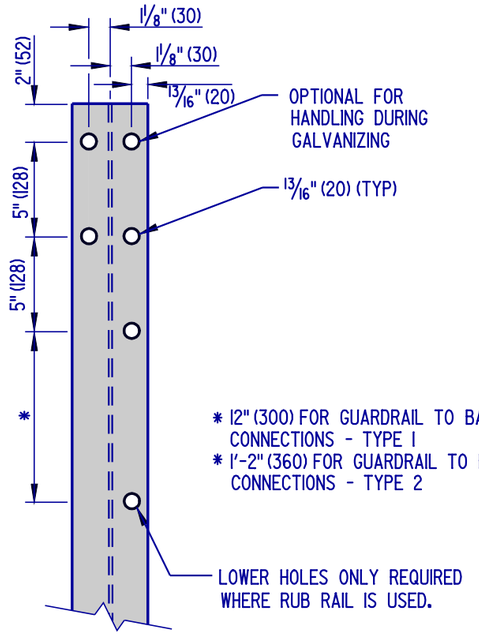


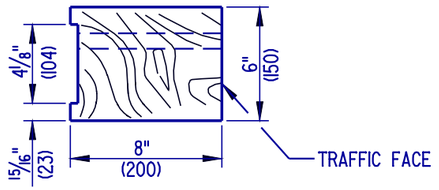
NOTE:
WHERE CONDITIONS REQUIRE,
ALTERNATE LENGTHS IN INCREMENTS
OF 6" (150) MAY BE USED.



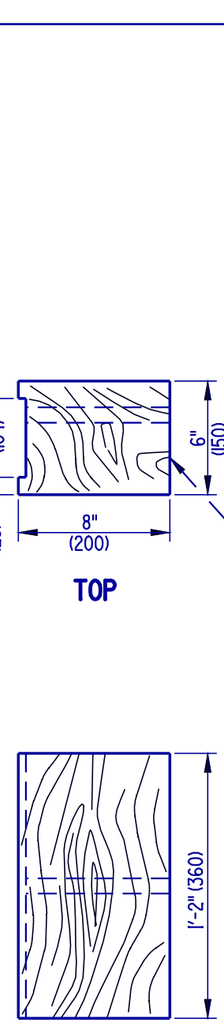
FRONT

POST (2)





TOP



SIDE

FRONT

OFFSET BLOCK (3)

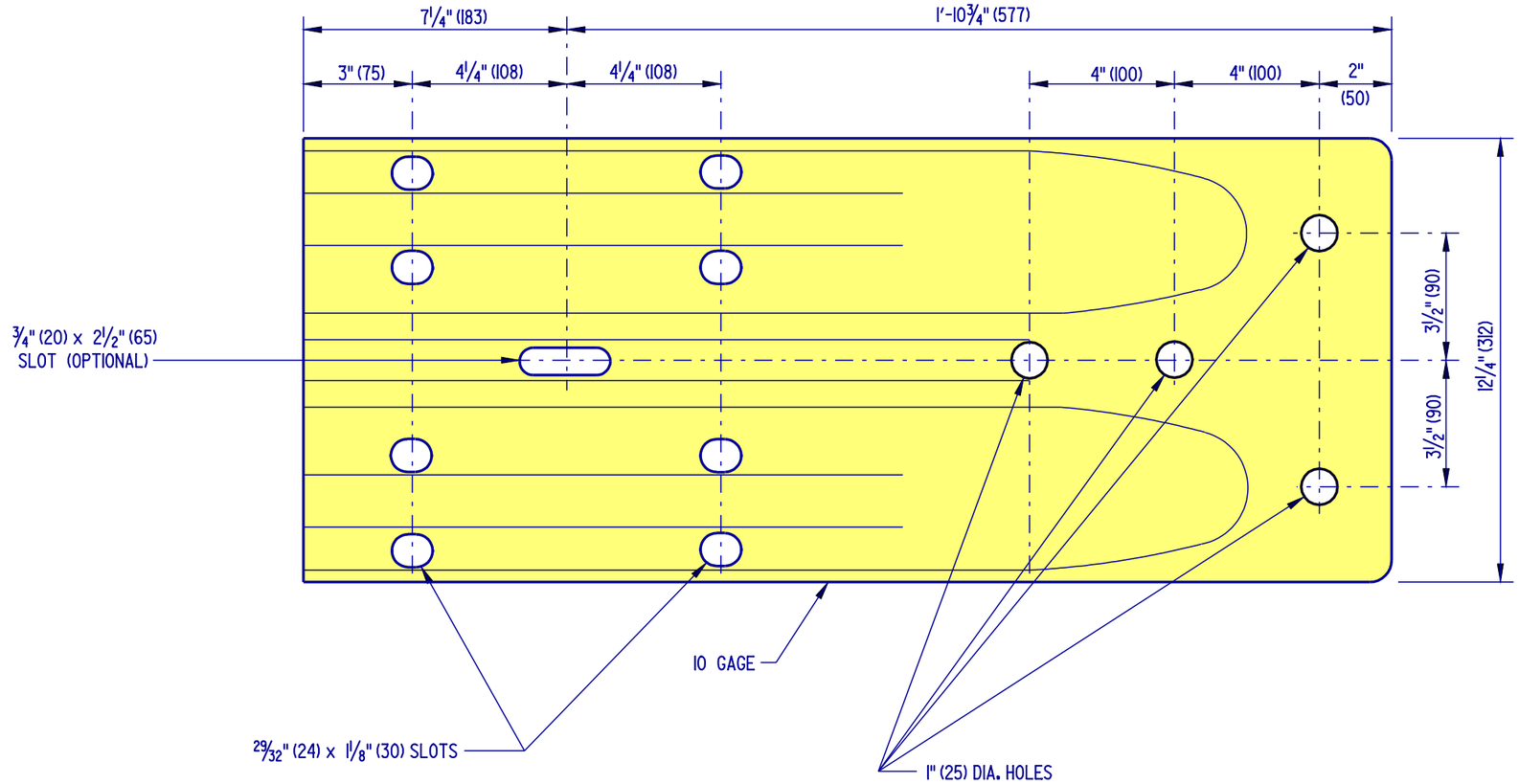
NOTE : ALL HOLES SHALL BE 13/16" (20) DIA. BOLT HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.

W-BEAM STEEL POST AND WOOD OFFSET BLOCK

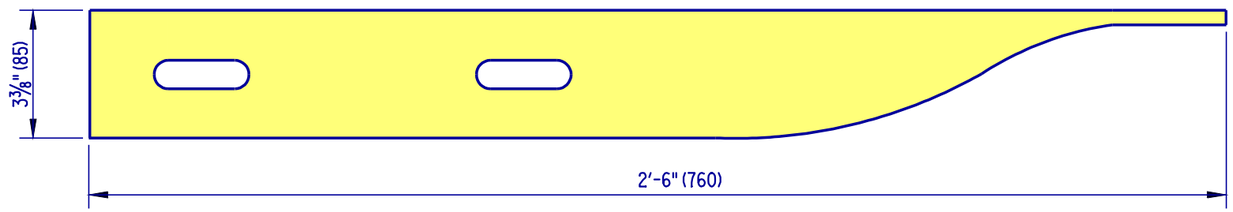
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks (CHIEF ENGINEER) 1/10/05 (DATE)
	STANDARD NO. B-13 (2004)	SHT. 2 OF 13	RECOMMENDED Dennis M. Office (DESIGN ENGINEER) 1/3/05 (DATE)

09/28/2004

SCALE : N.T.S.



ELEVATION



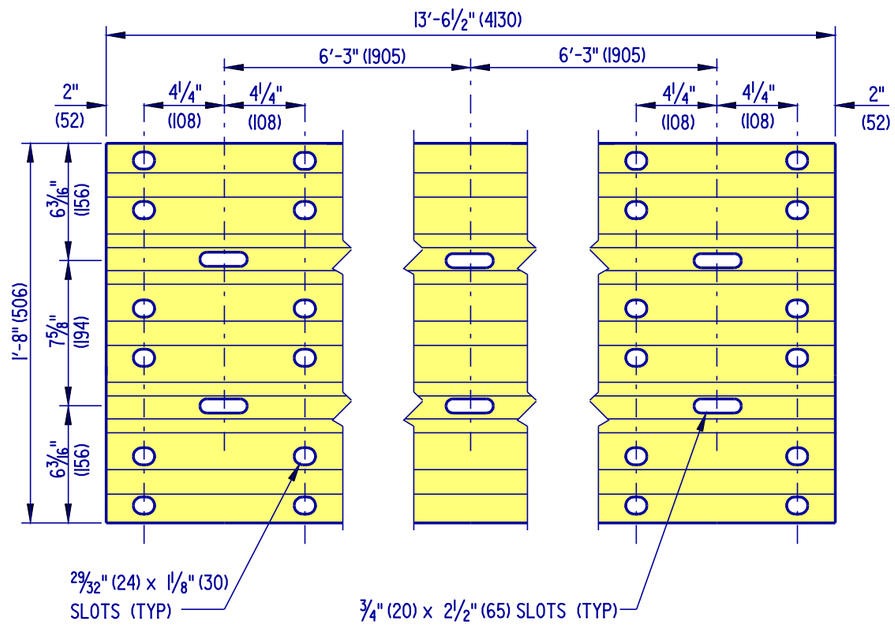
PLAN

W-BEAM TERMINAL CONNECTOR (5)

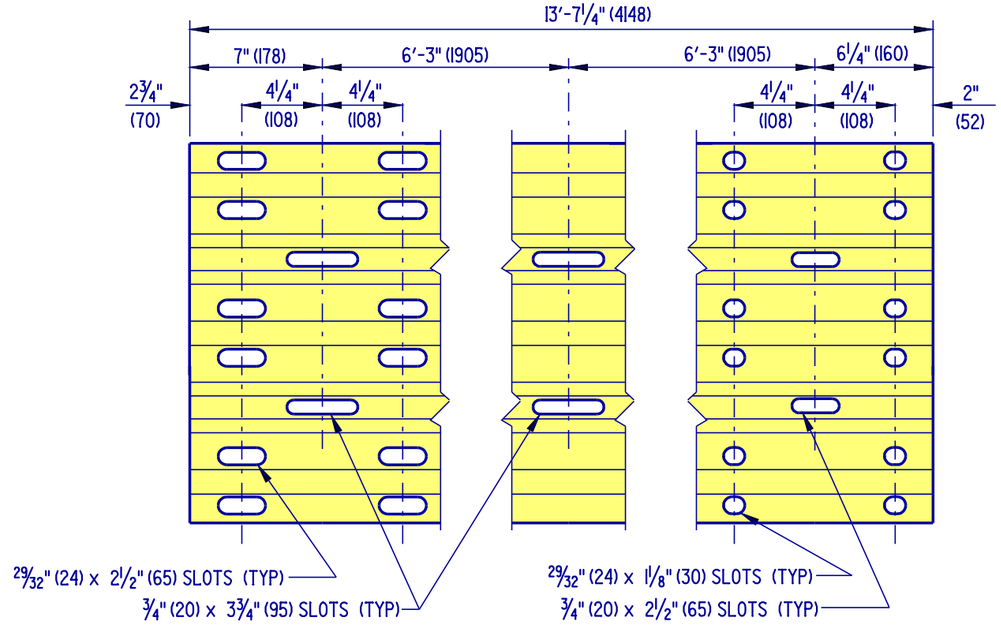
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 3 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

09/27/2004

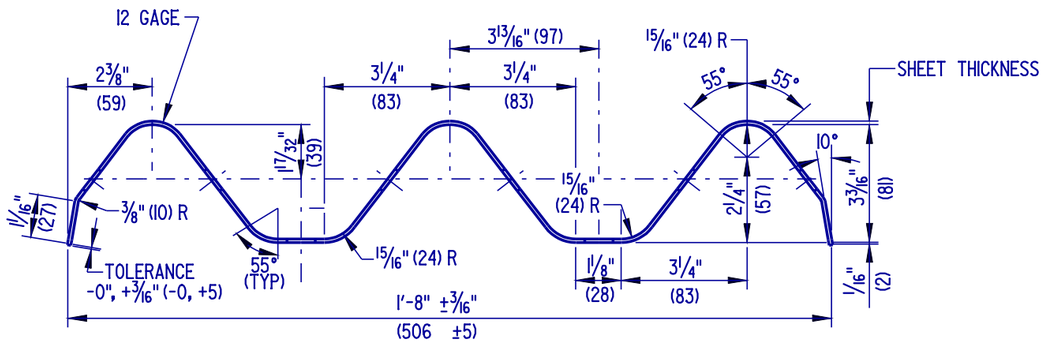
SCALE : N.T.S.



THRIE BEAM ELEVATION



THRIE BEAM EXPANSION ELEMENT

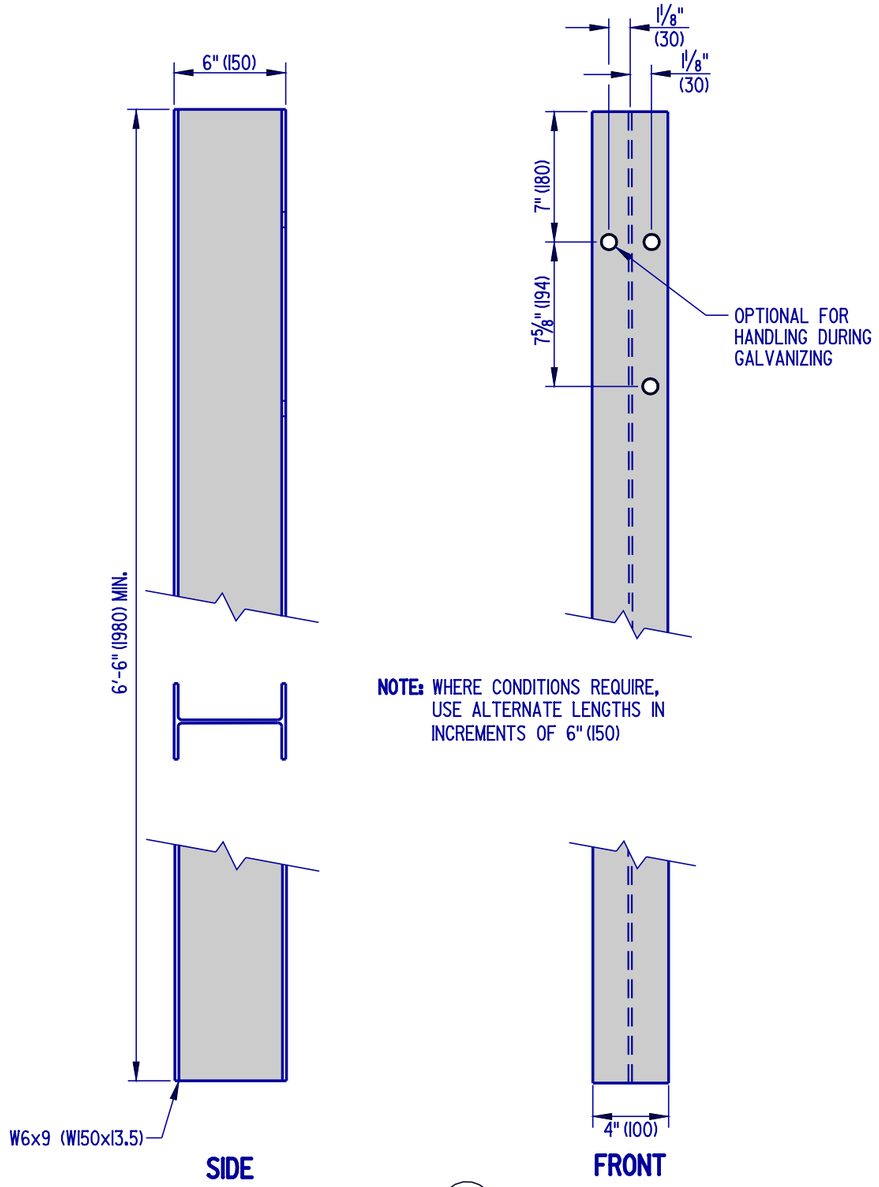


THRIE BEAM SECTION

DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 4 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

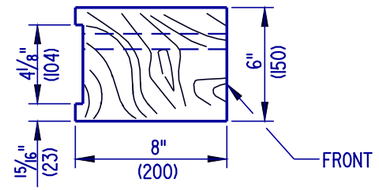
09/28/2004

SCALE : N.T.S.

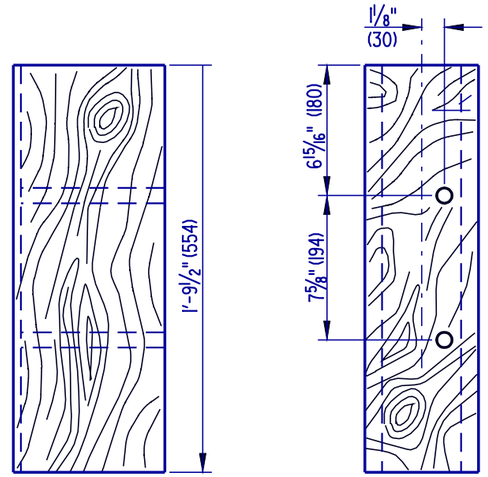


NOTE: WHERE CONDITIONS REQUIRE, USE ALTERNATE LENGTHS IN INCREMENTS OF 6" (150)

POST (2)



TOP



OFFSET BLOCK (3)

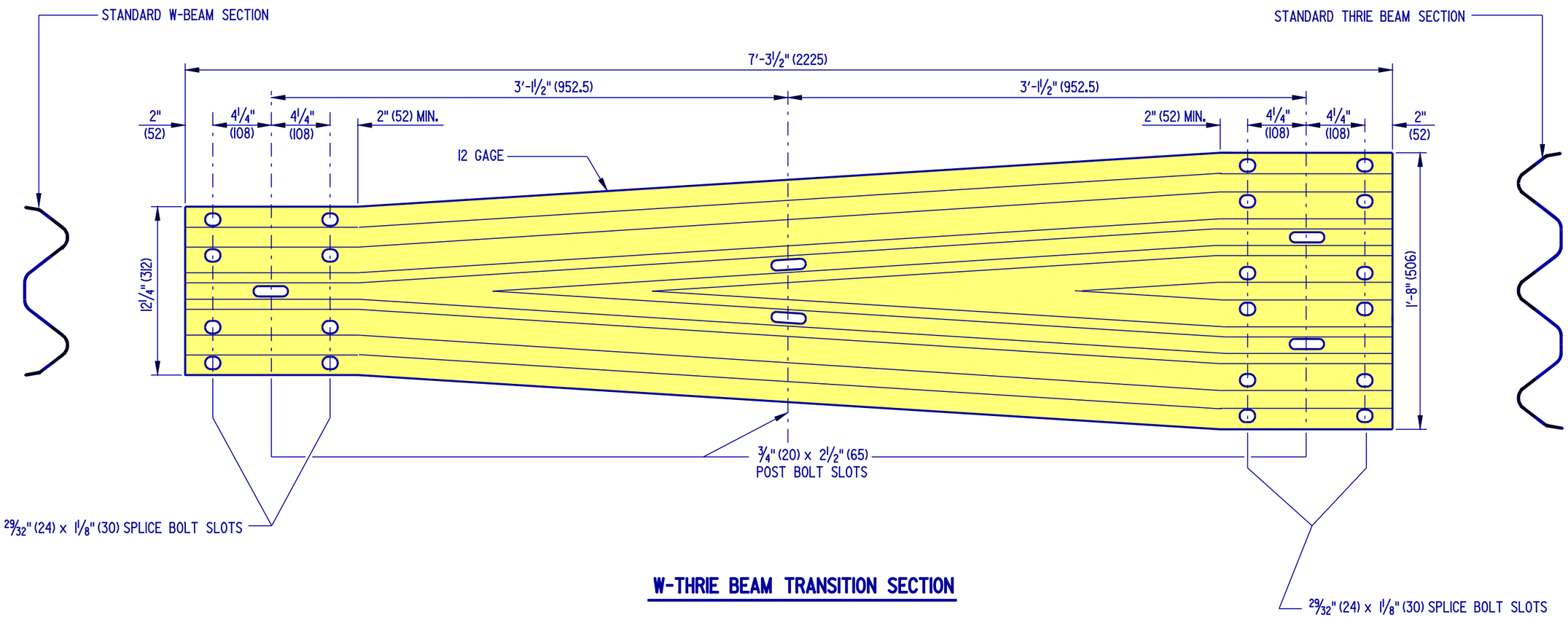
THRIE BEAM STEEL POST AND WOOD OFFSET BLOCK

NOTE :
ALL HOLES SHALL BE 13/16" (20) DIA. BOLT HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.

DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 5 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

09/28/2004

SCALE : N.T.S.



W-THRIE BEAM TRANSITION SECTION

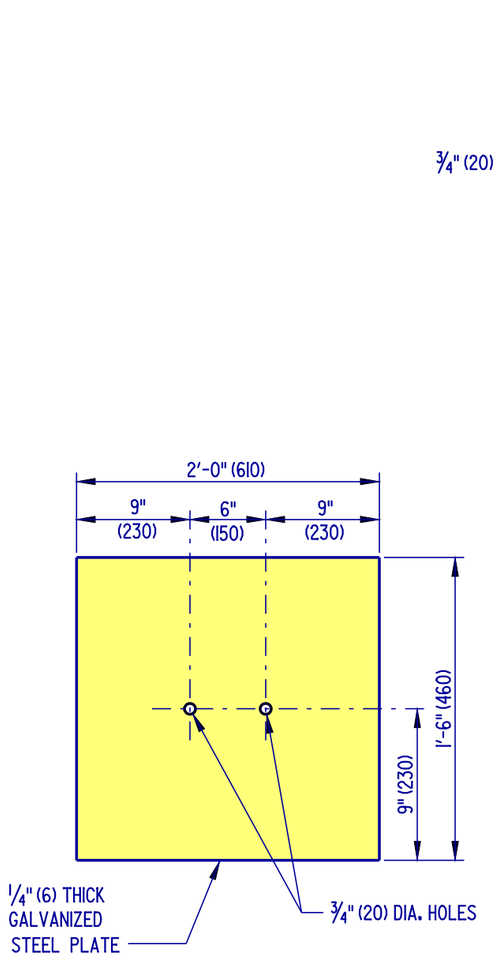
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 6 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

09/10/2004

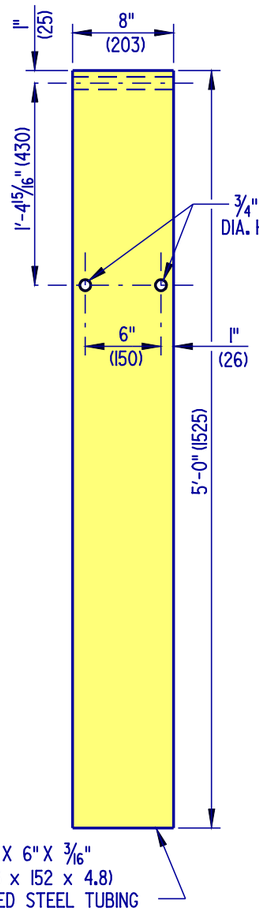
SCALE : N.T.S.

NOTES : 1). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.

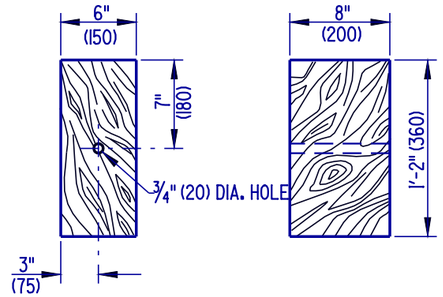
2). ALL WOOD SIZES ARE NOMINAL DIMENSIONS.



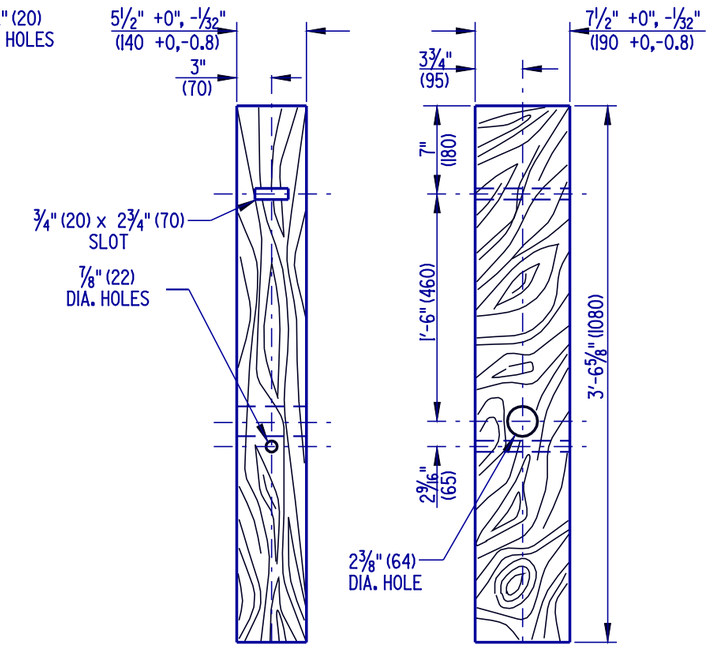
SOIL PLATE



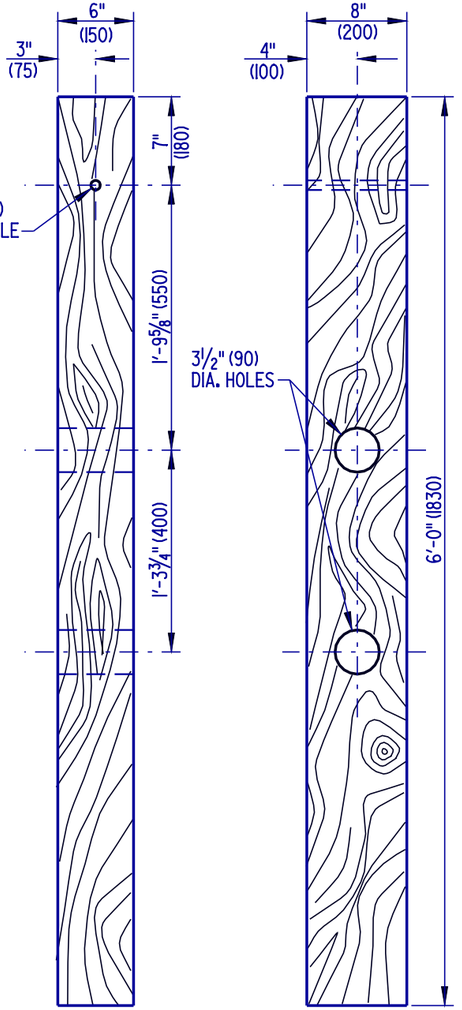
STEEL TUBE



WOOD BLOCK



SHORT WOOD BREAKAWAY POST

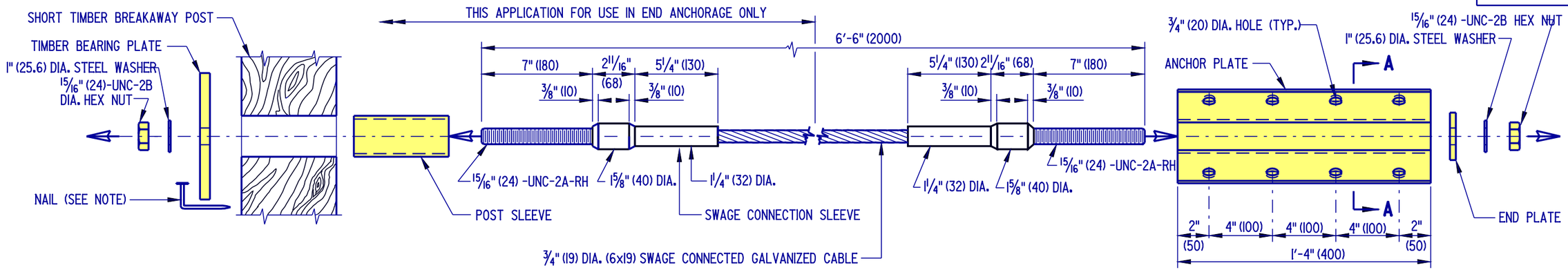


LONG WOOD BREAKAWAY POST

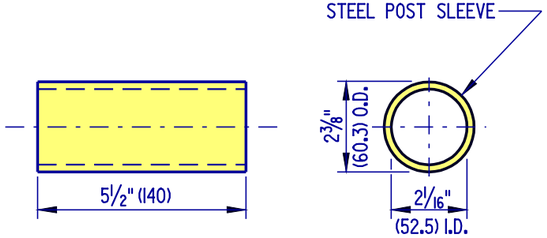
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 7 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

09/21/2004

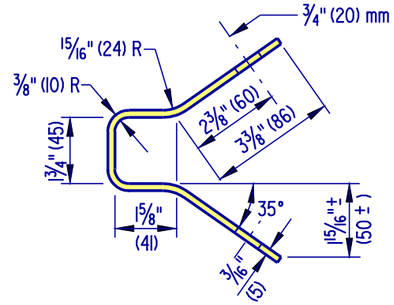
SCALE : N.T.S.



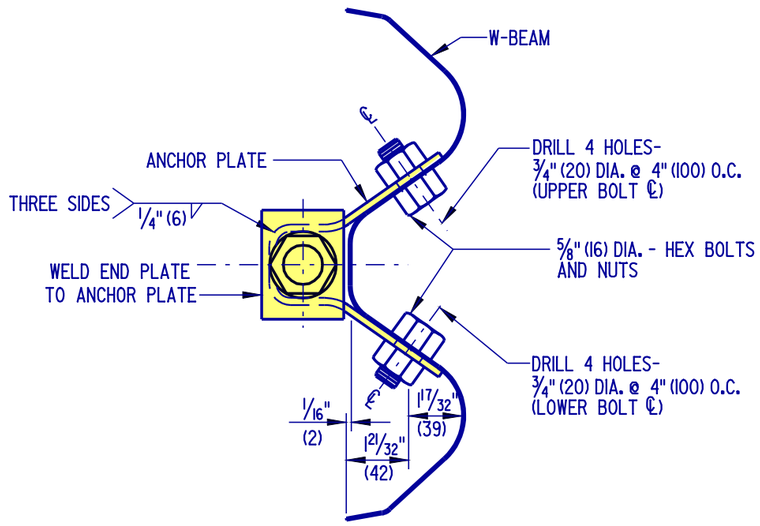
SWAGED CABLE ASSEMBLAGE AND RELATED HARDWARE ASSEMBLY



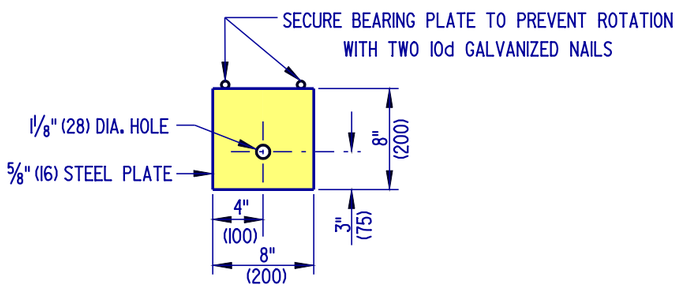
POST SLEEVE



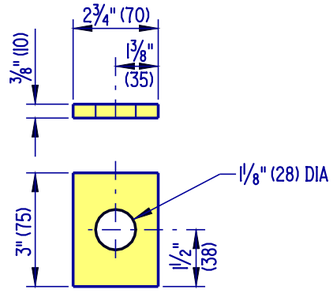
SECTION A-A



ANCHOR PLATE TO W-BEAM CONNECTION DETAIL



TIMBER BEARING PLATE



END PLATE

NOTES: 1). TO ENSURE THAT THE TIMBER BEARING PLATE REMAINS IN POSITION, 2 - 10d GALVANIZED STEEL NAILS SHALL BE DRIVEN IN THE SHORT TIMBER BREAKAWAY POST, AND BENT OVER BEARING PLATE.

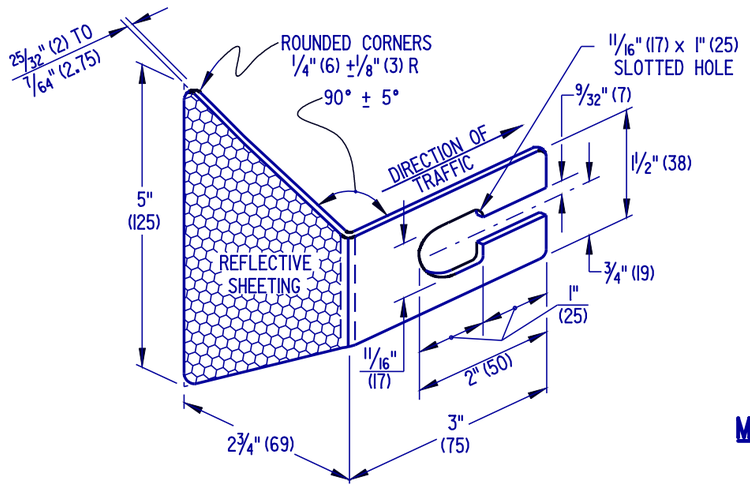
2). TIGHTEN ASSEMBLY UNTIL CABLE IS TAUGHT.

3). ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.

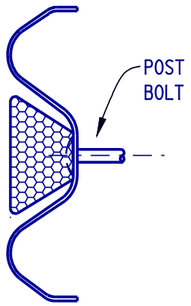
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE			APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 8	OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

09/21/2004

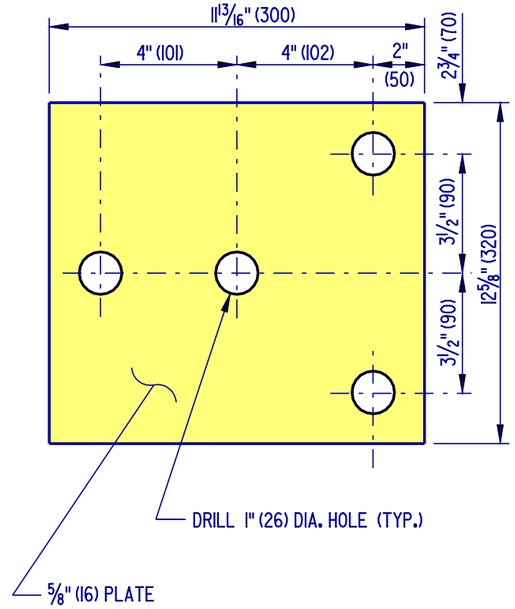
SCALE : N.T.S.



GUARDRAIL REFLECTOR



MOUNTING POSITION

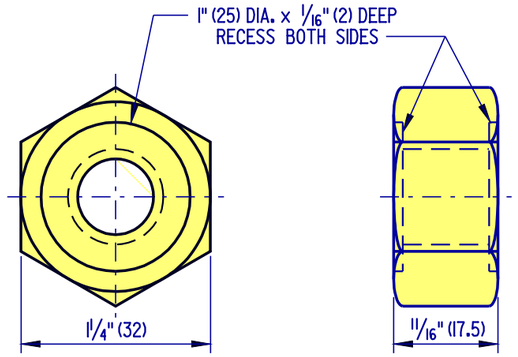


BEARING PLATE DETAIL (II)

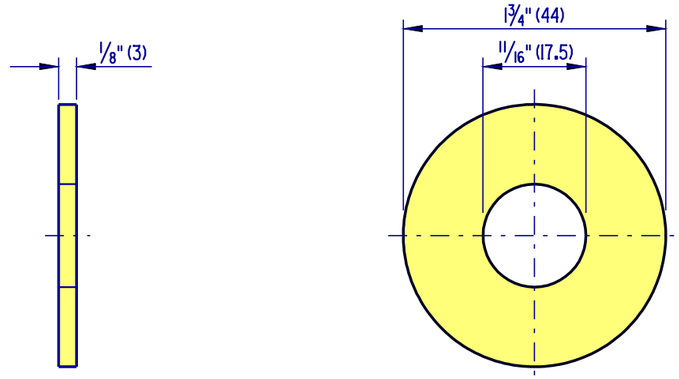
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 9 OF 13	RECOMMENDED Dennis M. O'Shea DESIGN ENGINEER 1/3/05 DATE

12/08/2004

SCALE : N.T.S.

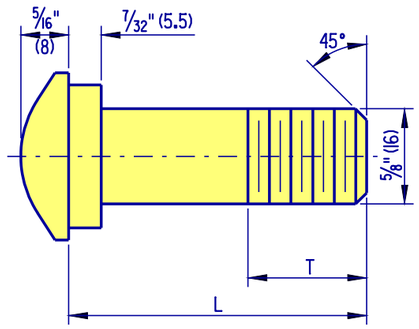


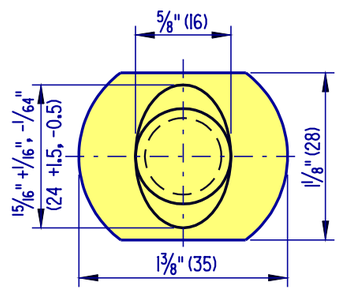
RECESSED NUT (FOR 5/8" (16) GUARDRAIL BOLT)



STEEL WASHER (FOR 5/8" (16) GUARDRAIL BOLT)

NOTE: DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASED ON METAL THICKNESS.





GUARDRAIL BOLT

L	T (MIN.)
1 1/4" (35)	FULL THREAD LENGTH
2" (50)	FULL THREAD LENGTH
4" (100)	FULL THREAD LENGTH
10" (255)	4" (100) THREAD LENGTH
18" (460)	4" (100) THREAD LENGTH

NOTES : 1. ALL FILLETS SHALL HAVE A MINIMUM RADIUS OF 1/16" (2).
2. IF THE BOLT EXTENDS MORE THAN 1/2" (12) BEYOND THE NUT, THE BOLT SHALL BE TRIMMED BACK AS PER THE DEPARTMENT'S SPECIFICATIONS.

DELAWARE
DEPARTMENT OF TRANSPORTATION

HARDWARE

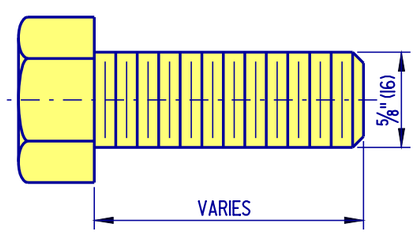
STANDARD NO. B-13 (2004) | SHT. 10 OF 13

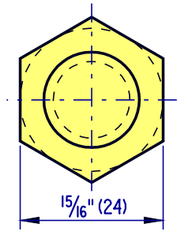
APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE

RECOMMENDED Dennis M. Office DESIGN ENGINEER 1/3/05 DATE

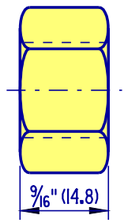
09/23/2004

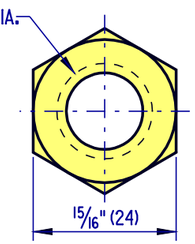
SCALE : N.T.S.



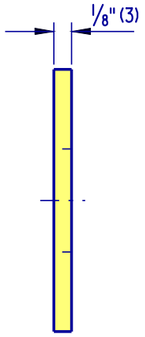


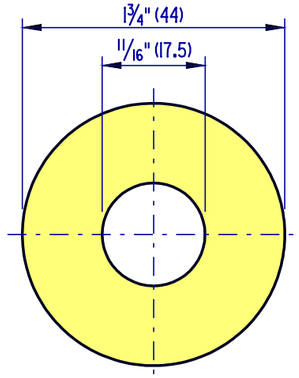
5/8" (16) HEX BOLT





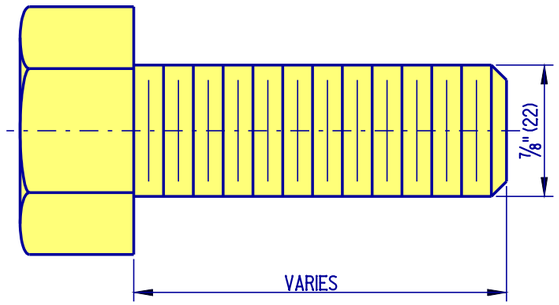
5/8" (16) HEX NUT

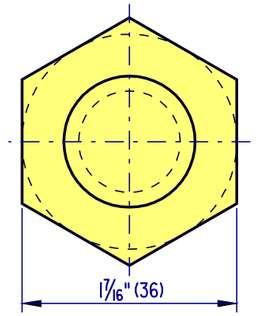




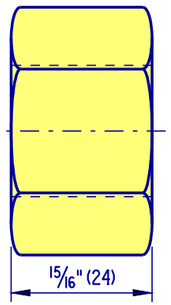
5/8" (16) STEEL WASHER

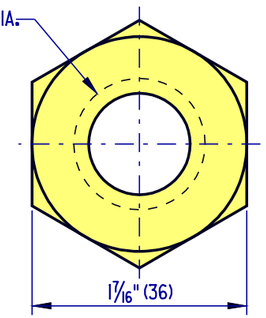
NOTE : DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASE METAL THICKNESS.





HIGH-STRENGTH STRUCTURAL HEX BOLT



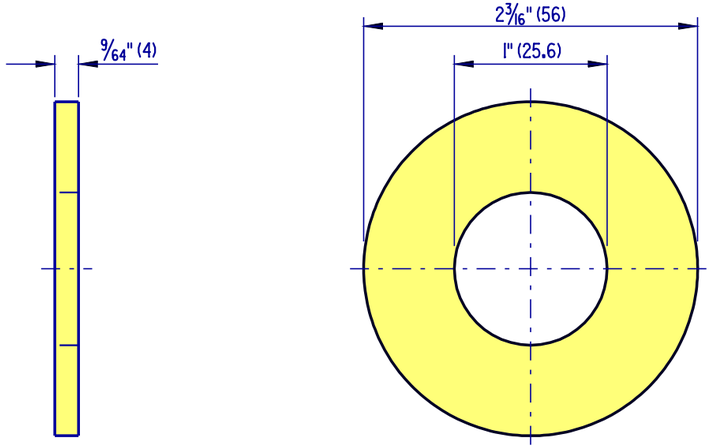


HIGH-STRENGTH STRUCTURAL HEX NUT

DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 11 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

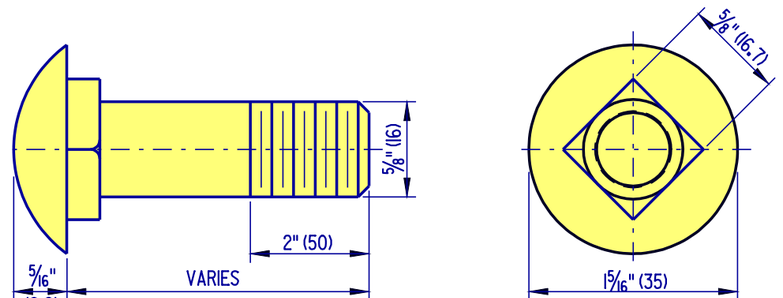
09/21/2004

SCALE : N.T.S.

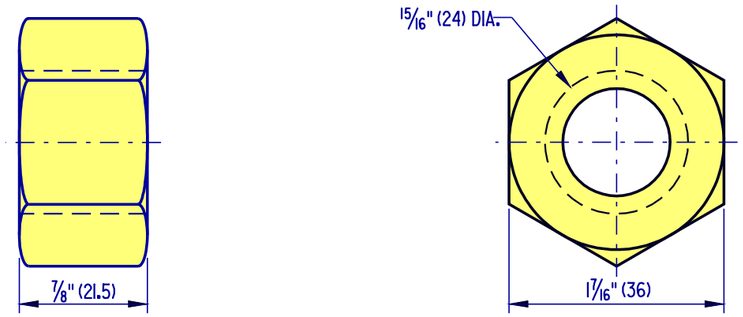


STEEL WASHER

NOTES : 1. FOR USE WITH SWAGED CABLE ASSEMBLAGE.
2. DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASE METAL THICKNESS.



5/8" (16) CARRIAGE BOLT



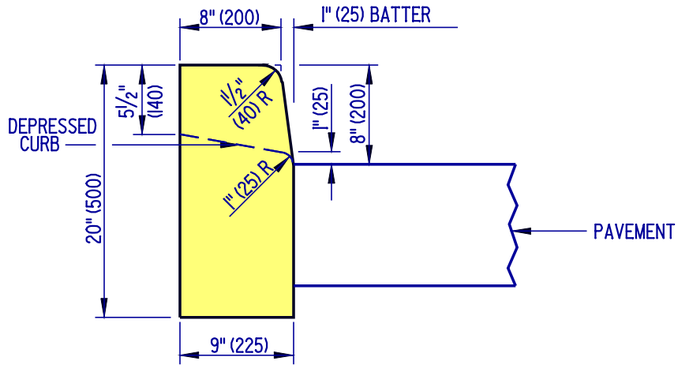
15/16" (24) HEX NUT

NOTE : FOR USE WITH SWAGED CABLE ASSEMBLAGE.

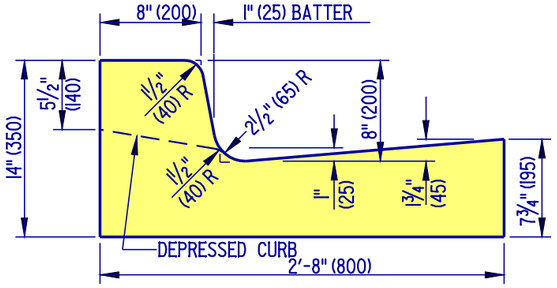
DELAWARE DEPARTMENT OF TRANSPORTATION	HARDWARE		APPROVED Carolann Wicks CHIEF ENGINEER 1/10/05 DATE
	STANDARD NO. B-13 (2004)	SHT. 12 OF 13	RECOMMENDED Dennis M. O'Toole DESIGN ENGINEER 1/3/05 DATE

09/10/2004

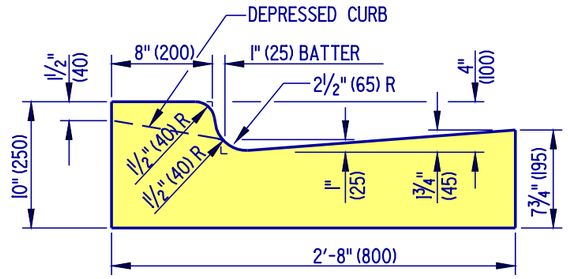
SCALE : N.T.S.



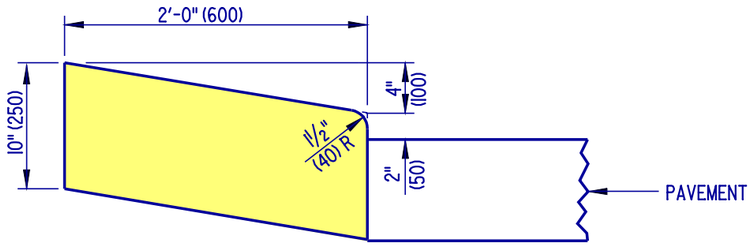
P.C.C. CURB
TYPE 1



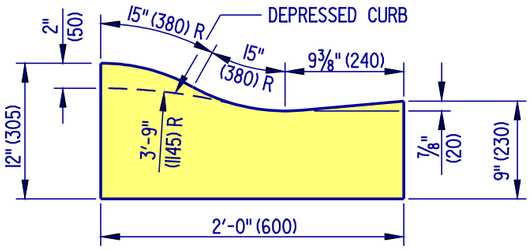
INTEGRAL P.C.C. CURB AND GUTTER
TYPE 1



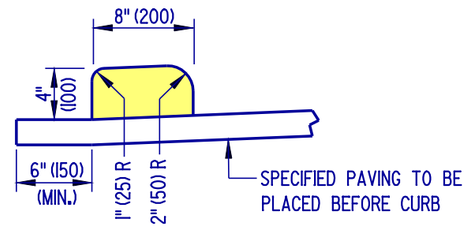
INTEGRAL P.C.C. CURB AND GUTTER
TYPE 4



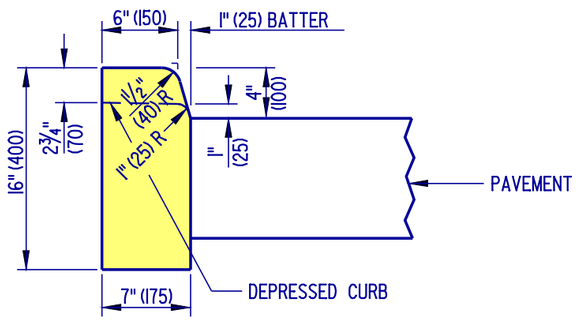
P.C.C. CURB
TYPE 2



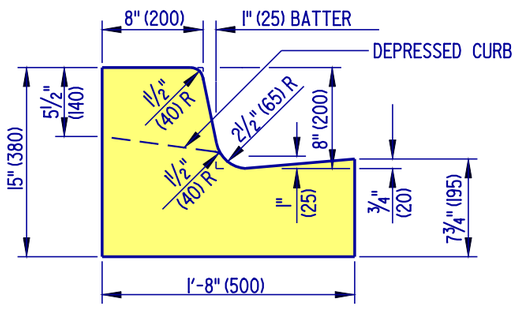
INTEGRAL P.C.C. CURB AND GUTTER
TYPE 2



HOT-MIX, HOT LAID BITUMINOUS CONCRETE CURB



P.C.C. CURB
TYPE 3



INTEGRAL P.C.C. CURB AND GUTTER
TYPE 3

NOTES:
1. WHEN INTEGRAL P.C.C. CURB AND GUTTER IS PLACED ADJACENT TO PORTLAND CEMENT CONCRETE PAVEMENT, CONSTRUCT THE JOINT AS PER THE LONGITUDINAL JOINT SEALANT DETAIL ON STANDARD P-2, SHEET 3 OF 5. USE APPROVED JOINT FILLER TO SEAL. WORK TO BE PAID UNDER RESPECTIVE CURB AND GUTTER ITEM.
2. DEPRESS CURB AT DRIVEWAYS AS DETAILED.
3. DEPRESS CURB FLUSH WITH PAVEMENT AT CURB RAMPS. MAXIMUM SLOPE OF DEPRESSED CURB IS 12:1.

DELAWARE DEPARTMENT OF TRANSPORTATION	P.C.C. CURB, P.C.C. CURB & GUTTER, AND HOT-MIX CURB	APPROVED Carolann Wicks (CHIEF ENGINEER) 1/10/05 (DATE)
	STANDARD NO. C-1 (2004) SHT. 1 OF 1	RECOMMENDED Dennis M. Office (DESIGN ENGINEER) 1/3/05 (DATE)

09/27/2004